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ABSTRACT

This paper offers brief discussions of central aspects of public policy and curriculum guidelines for early childhood education in Minnesota and provides capsule descriptions of Piagetian research and national events reflecting trends in early childhood education. Following examination of these topics, the discussion contrasts the Piagetian approach to the development of knowledge and moral values with that of the scientific theory developed by learning theorists. Educational implications of a generally Piagetian approach to education are specified and compared with present practices common in public school kindergartens and primary grades. The comparison is organized around the following questions: What is the aim of education from society's point of view? What is the aim of education for the individual? How does one know? What are the sources of knowledge? What is development? What factors influence development? What is learning? What is the relationship of language to thought? What is the relationship of play to thought and learning? How should one teach? What should the curriculum be like? And, finally, what educational policies are needed to foster Piagetian perspectives for early childhood education in Minnesota? It is concluded that education must take a Piagetian approach because the present model of schooling is not capable of producing citizens with abilities and qualities demanded by conditions of a rapidly changing world. (RH)

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Early Childhood Education in Minnesota: A Position Paper

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Introduction

Throughout the country there is an interest and concern among educators in early childhood about identifying what is a developmentally appropriate education for young children. In Minnesota the Department of Education has viewed early childhood as the period from birth through age 8 or through third grade.

Public Policy. Since 1974 we have been committed to a public policy of early childhood and family education for young children from birth to Kindergarten. We have seen a need for constant involvement of young children beginning at birth and continuing up to the time of formal schooling in programs that occur outside the home but which are carried out for and with members of the child's family. The primary emphasis for public school programs through community education is to be a support to parents in facilitating the development of their children.

Our public policy in Minnesota states that the young child from birth to Kindergarten shall be helped to develop and learn through involvement of family members with educators who have knowledge of young children and of parent education. The policy does not specify how children shall be taught or what children shall be taught.

Since 1974 Minnesota law requires public school districts to provide the opportunity for every child who is five by September 1 to attend Kindergarten. Again, there is no specification of how the child shall be taught. A state board rule lists the traditional subject areas to be taught in school. The State Board of Education is reviewing the elementary rule on curriculum offerings. What is to be taught is the specific content of a new rule.

Another public policy affecting early childhood education is the Minnesota statute on compulsory attendance. It becomes mandatory for children to attend school if they are seven on September first.

Curriculum Direction. In 1964 the Minnesota Department of Education distributed a Kindergarten curriculum guide. This guide encouraged a child-oriented curriculum in Kindergarten. The guide reflected a view of development that was based on the work of Arnold Gesell. This view held to a belief in maturation as being an important factor in determining expectations for young children. It states that "certain organized patterns of growth of neural structures must occur before certain experiential factors can effectively contribute to development" (Jensen, 1969, p. 2).

Nationally, during this time our state curriculum guide was developed, some very different things were happening. In essence our Kindergarten guide

encouraged educators to let the child unfold from within. The following national events reflect different trends in early childhood:

- J. McV. Hunt (1961) brought together research findings to support the strong effect of early experience on educational processes. Hunt showed that a belief in a fixed developmental rate kept adults from providing the quality of experiences young children need for early development. Hunt's findings also refuted the belief in a fixed intellectual capacity.

- Benjamin Bloom (1964, 1965) brought together research findings from about 1,000 longitudinal studies carried out over 40 years. He found support for his hypothesis that the environment has the greatest effect upon the 30 characteristics he studied during the period of each characteristic's most rapid growth. The characteristics of achievement, intelligence and physical growth were most rapid for children during the first five years of life.

- Scientists, scholars and educators met in 1959 to discuss how education in science might be improved in the schools and the statement of Jerome Bruner (1960) that any subject could be taught effectively in some intellectually honest form to any child at any stage of development became a password for those in curriculum.

- In 1964 a planning committee was formed to make recommendations for an action program, Head Start. The goals of this program were not substantially different from the goals of the Minnesota state Kindergarten guide. The actual goals of Head Start were soon changed as evaluation techniques were developed to determine the effectiveness of this new program.

In 1978 the Minnesota Department of Education distributed Some Essential Learner Outcomes and Interaction Suggestions in Early Childhood Education. This document reflected a state-wide committee's work for two years. It described the developmental characteristics of children from birth through first grade and it gave some suggestions for how adults could interact with the child around each particular developmental or curricular area. The SELOs made use of the theory of development presented by Erik Erikson in the area of personality development. The SELOs tried to reflect the ideas of Piaget and others on development. This document does not have a wide enough range of outcomes for children at the upper levels of development. It has not been helpful in deciding what to teach or how to teach groups of children.

While Kindergarten has been seen as a distinct form of education, the child in grades 1-3 was educated in a way that was more consistent with the total elementary and secondary program. The programs have been given curriculum direction through Some Essential Learner Outcomes that were developed by the Minnesota Department of Education through statewide committee in art, environmental education, health, language arts, mathematics, media, music, physical education, reading, science and social studies. Each of these disciplines identified what should be taught in their area.

Learning in the primary grades has been an enforcement from the outside rather than an unfolding from within the child. Effective teaching models, such as Madeline Hunter's, have been developed to Teach More Faster as one of Hunter's books is called. Ways to help students retain what is taught, ways to motivate students to learn, and ways to reinforce students for their behavior are all components of effective teaching.

In 1980 a set of guidelines were developed by the Minnesota Department of Education for elementary schools. These guidelines recommended percentages of time that should be allocated to each of the subject areas. Districts were free to ignore these guidelines, but they were an attempt to suggest a balanced curriculum.

In 1980 a committee of college teacher educators began meeting to discuss what a beginning Kindergarten teacher should know and be able to do to provide a developmentally appropriate program in Kindergarten. This group continues to meet and work on a document about this topic. They have involved Kindergarten teachers in working on the document and in participating in inservice about the document.

A Personal Perspective. My own teaching experience has been in the primary grades, pre-first grade through third grade, and in special education for children with learning disabilities and children with emotional disturbances. Eight years of my teaching experience were in Minnesota public schools.

Before coming to the Department of Education, I had an opportunity to spend a year in observational research on two-year-old children. I saw 24 low-income, multi-ethnic children from the inner city in Minneapolis. Half of them attended a preschool and half of them did not. I went to the children's homes and I went to the children's preschool. The school had many planned activities for the children, and volunteer teachers were directive in helping the children make use of many educational toys. The school program was intended to provide language stimulation for the children and the adults were very verbal. The homes varied from one in which a child rocked back and forth as he watched adult TV programs by himself to homes in which perceptive mothers interacted with the children. I collected a lot of data that could be tabulated, but it is the dynamic potential of the child of two that has stayed with me. It became the driving force for me to focus my efforts in education on the early years.

In 1970 I came to the Minnesota Department of Education as the state's first consultant in early childhood. I had never taught Kindergarten and my work with four and five-year-olds was limited to psychological testing.

In my work with the state I have had a wide tolerance for eclectic approaches to the education of young children. Taking a position has not been an easy stance for me. This paper has become a personal search for the type of leadership that is needed to bring about changes in the way schools identify and meet the learning needs of young children.

Piagetian Research.

When Copernicus theorized from scientific evidence that the earth revolved around the sun, this radically different explanation of reality was too much for the scientists of his day. Kamii (1980) suggests that the research of Piaget is a similarly radical departure from our understanding of how human beings come to know and to develop moral values.

Jean Piaget discovered and described the course of cognitive growth in human beings and he developed a theory to explain it. He completed a doctorate in science in 1918 and went to Paris the following year to do psychological research and to study philosophy. For 60 years Piaget worked out of his knowledge of biology, psychology and philosophy to develop an understanding of how the human being comes to know the world through study of children.

Gruber & Voneche state:

> "His ideas and discoveries are spread out in some fifty books and hundreds of articles. In his work as a psychologist...he has tried to show the childhood origins of human knowledge in almost every sphere: logic, space, time, chance, morality, play, language, mathematics. He has dealt with a wide spectrum of psychological processes: reasoning, perception, imagery, memory, imitation, action. Beyond this, or rather interwoven with this vast effort, is his concern with elaborating a philosophical point of view, genetic epistemology, and with exploring in considerable depth its biological as well as its psychological implications" (Gruber & Voneche, 1977, p. xviii).

Piaget has not made direct, practical applications of his work in human thinking to educational settings. Many people have tried to do this and to gain assurances that they were making good applications. According to Almy, few have worked with the "stamina and persistence" of Constance Kamii in developing teaching implications from the writings of Piaget and his colleagues. For 20 years Kamii has been focusing on the application of Piagetian research to programs for young children in preschools. More recently she has been working with Kindergarten and first grade children. Elkind, Furth and others have developed implications for programs with school-age children.

Format of this Paper.

In this paper the Piagetian approach to the development of knowledge and moral values will be contrasted with the scientific theory developed by learning theorists. Because present school practices are derived from Behaviorism, this paper will try to lay foundations in some areas to reveal the profound differences in the two approaches. These topics may appear to be far removed from the pressing problems in the schools. To me they have become the heart of the issue.

The desired status of educational programs for young children derived from a Piagetian base of how knowledge is acquired will be described and it will be contrasted with present school practices as I perceive them to be in our public school kindergartens and primary grades.

WHAT IS THE AIM OF EDUCATION FROM THE POINT OF VIEW OF THE SOCIETY?

Desired Status

Piaget says: "For me, education means making creators, even if there aren't many of them, even if the creations of one are limited by comparison with those of another. But you have to make inventors, not comformists" (Bringuier, 1980, p. 132).

Susan Isaacs, an English psychologist and psychoanalyst who ran a school for young children, is quoted by her biographer as saying: "The aim of modern education is to create people who are not only self-disciplined and free in spirit, but also responsible and generous in social life, able to give and take freely from others, willing to serve social ends and to lose themselves in social purposes greater than themselves" (Gardner, 1967).

Phoenix, in a discussion of curriculum, states: "...the special office of education is to widen one's view of life, to deepen insight into relationships, and to counteract the provincialism of customary existence - in short, to engender an integrated outlook" (Phoenix, 1964, pp. 3-4).

Present Status

Skinner suggests: "An educated man is perhaps better able to adapt himself to his environment and to adjust to the social life of his group, and a culture which emphasizes education is probably more likely to survive" (Skinner, 1968, p. 200).

Dreeben states that schooling contributes to learning four norms:

- Independence: The ability to act by oneself and accept personal responsibility for one's conduct and accountability for its consequences.
- Achievement: The ability to perform tasks actively and master the environment according to certain standards of excellence.
- Universalism: The ability to acknowledge the rights of others to treat one as a member of a group.
- Specificity: The ability to let oneself be treated on the basis of a few discrete characteristics rather than as a whole person.

Goodlad quotes another authority: "Lawrence Cremin's succinct definition suggests the nature and scope of education: '(Education is) the deliberate, systematic, and sustained effort to transmit or evoke knowledge, attitudes, values, skills and sensibilities.'...Schools take on special significance because they and they alone were created to assure that a deliberate, systematic, and sustained process of educating would go on in our country" (Goodlad, 1979, p. 34).

These aims are contrasting quite different societal purposes. The viewpoints on the left suggest a broader, freer aim with a hopefulness and vision about

the potential for human growth that can be realized in the children we educate. By contrast, the views on the right all speak to a narrowing of expectations and a precision in both the process and the end outcome of education.

WHAT IS THE AIM OF EDUCATION FOR THE INDIVIDUAL?

Desired Status

"Education shall be directed to the full development of the human personality and to strengthening of respect for human rights and fundamental freedoms" (Article 25, Universal Declaration of Human Rights, United Nations, 1948).

Piaget states: "(Education) is really to create individuals capable of intellectual and moral autonomy and of respecting this autonomy in others by applying the rule of reciprocity that makes it legitimate for themselves" (Piaget, 1973, p. 91).

Piaget states that an intellectual education gives a student knowledge through free investigation and spontaneous effort and the student will be able to retain it. It gives a methodology of learning to make reason function for oneself and building one's own ideas freely. Logic is not innate; it is built up step by step through the child's own activities. The ethical education is comprised of independence, becoming a master of oneself through discipline, and of reciprocity based on mutual respect. Piaget states: "...the truly logical persons who are masters of their reasoning power are as rare as the truly moral men who exercise their conscience with all their strength" (Piaget, 1973, p. 50).

Dearden, an English philosopher, suggests the same aim for primary education: Personal autonomy based on reason. He says that there are two aspects to autonomy. One is negative: Independence

Present Status

Skinner notes that "A culture must remain reasonably stable, but it must also change if it is to increase its chances of survival. The 'mutations,' which account for its evolution, are the novelties, the innovations, the ideosyncracies which arise in the behavior of individuals. They are not all useful; in fact many of them...are harmful." Skinner adds, however, that "anything which encourages individuality is probably a move in the right direction" (Skinner, 1968, pp. 171-172).

When Skinner tries to characterize individuality, he uses the terms "freedom" and "originality" and he defines them in the ways shown below.

- Freedom.

To develop the technology which reduces aversive features of the environment.

To learn techniques of self-management which permit one to deal effectively with aversive features of the environment and to escape from positive reinforcements (e.g., drugs) which have consequences that are ultimately aversive.

- Originality. Skinner believes that the student is most likely to solve problems in a novel environment if the student knows as much as possible about earlier solutions. There is no danger that teaching facts will overload the student's mind.

Sizer states: "The essential claims in education are very elementary: literacy, numeracy, and

of authorities who would dictate what one is to believe or what one is to do. The positive aspect is: One tests the truth of things for oneself, by experience or by a critical appraisal of the testimony of others, and forms intentions and makes choices based on a set of values. Dearden states: "Both understanding and choice, or thought and action, are therefore to be independent of authority and based instead on reason. This is the ideal" (Dearden, 1968, p. 46).

Kamii discusses moral autonomy and says: "The essence of autonomy is that children become able to make decisions for themselves. Autonomy is not the same thing as complete freedom. Autonomy means taking relevant factors into account in deciding what the best course of action might be for all concerned. There can be no morality when one considers only one's own point of view...." (Kamii, 1982, p. 5).

Kamii believes that students graduating from our high schools should think logically, critically and autonomously. She provides evidence that only one-fourth or one-fifth of the students who are college freshmen can do this (cf. Kamii, 1981, p. 413).

civic understanding....

- Literacy implies clear thought; that is, one must read easily and sensitively enough to comprehend at least the basic arguments presented by contemporary political and social life. Without that ability and the correlative ability to present such arguments oneself orally and in clear writing a citizen cannot fully participate in a democracy....
- Numeracy means the ability to use numbers, arithmetically and algebraically, and to understand the concepts, relationships, and logic embedded in mathematical thought....
- Civic understanding means a grasp of the basis for consensual democratic government, a respect for its processes and acceptance of the restraints and obligations incumbent on a citizen....

Although these three claims of the state are minimal, they should be maximal, as well" (Sizer, 1984, p. 86).

In this section, the single aim of autonomy has been presented as the desired status. This aim requires teachers to develop different approaches with children. These will be discussed in the section on teaching.

It is interesting to note the aim that Sizer has identified and to contrast it with another comment of his from his study of high schools. Sizer reports: "No more important finding has emerged from the inquiries of our study than that the American high school student, as student, is all too often docile, compliant, and without initiative. Some who have initiative use it to undertake as little engagement as possible with school.... There are too few rewards for being inquisitive; there rarely is extra credit for the ingenious proof. The construc-

tive skeptic can be unsettling to all too many teachers, who may find him cheeky and disruptive. Questing can be costly" (Sizer, 1984, p. 55).

In the writings of Kamii there are many references to heteronomy, being governed by someone else. Her description of intellectual heteronomy is not unlike the quote just given from Sizer. As an example of moral heteronomy, she cites the participants in the Watergate coverup.

HOW DOES ONE KNOW?

Desired Status

Kamii states: "Piaget's theory about how children learn moral values is fundamentally different from other theories and from common sense. The common sense view is that the child acquires moral values by internalizing them from the environment. According to Piaget, children acquire moral values not by internalizing or absorbing them from the environment but by constructing them from the inside, through interaction with the environment" (Kamii, 1982, p. 7).

The child is continually acting on and organizing experiences of the outside world through the child's own movement and use of all the child's senses. Absorbing and organizing experiences around the experiences that produce them is the child's way of bringing in and assimilating the outside world. This process of building up in one's mind a kind of working model of the world begins in infancy and continues throughout the lifetime of the individual. Many objects and events resist the activity patterns that the child tries out on them; this requires the child to make changes in the working model to accommodate new information.

Present Status

Langer states the point of view of the learning theorists: "The child is born empty of psychological content into a world of coherently organized content. Like a mirror, however, the child comes to reflect his environment; like an empty slate he is written upon by external stimulii; like a wax tablet he stores the impressions left by these stimuli; and like a machine he may be made to react in response to stimulating agents" (Langer, 1969, p. 51).

Learning theory approaches intellectual development the same way it approaches the study of any other behavior. Intellectual development consists of a large number of gradual changes is specific performances. The changes that occur in childhood are not different from those that occur in later life. A child has a more limited repertoire of behaviors than an adult. If a child cannot perform at a particular intellectual level, the child needs more appropriate conditions in the environment and the prerequisite learning that the child is lacking.

The child does not gain knowledge directly through the senses. The child cannot take in from the environment the sights, sounds, smells and sensations provided by the physical world. Rather the child mediates these experiences through mental frameworks or structures and the sense experiences have meaning because of the interpretation that the child gives them.

Knowledge is acquired by the child's own mental activity through interaction with the physical world of matter and the social world of human beings. The child constructs knowledge by acting directly on the environment and by mental actions. The child's spontaneous participation in action is the only type of action which is capable of developing knowledge and intelligence. Children need to form their own hypotheses and try them out through their own active manipulations. A child can be actively handling objects and still be mentally passive or disengaged. A child can be mentally active without manipulating anything physically.

At first the child's contacts with or actions on the world must be physical experiences of objects, events, or people. Later, a capacity to evoke and represent absent things through internal images is developed. Still later, a capacity for verbal symbols occurs. Images and symbols result in thought becoming action which is carried on inwardly, but it continues to be organized and structured by each individual. Ultimately, the young person and adult attain an ability to think abstractly free from the given facts of the real world. They can act with imagined possibilities or hypotheses which can be carried out to their logical conclusions, varied, reversed, or developed into a new set of consequences. All of this thinking is based, however, upon the framework that was first begun in infancy with actions upon objects. Although

the structure is continuously being expanded, organized and reshaped by experience, it is carried forward for the life of the child. The child was not born with the framework. The child constructed it bit by bit from its foundation.

These two views of how one comes to know are extremely different. Some writers compare the view on the left to a painter making a painting and the view on the right is more like a photographer snapping a picture.

Kamii suggests: "By shifting the focus of our thinking from what we do to children to how children develop, we can begin to view academic subjects and moral education, as well as mental health, from the standpoint of how children construct their own ideas. Children respect the rules they make for themselves. They also work hard to achieve the goals they set for themselves" (Kamii, 1982, p. 17).

WHAT ARE THE SOURCES OF KNOWLEDGE?

Desired Status

There are three major sources of knowledge that have been identified by Piaget: social knowledge, physical knowledge, and logicomathematical knowledge. Each of these sources has a different content and is acquired by the child in a different way. Social and physical knowledge involve information that is external to the child. Logicomathematical knowledge relates to the relationship between objects which has its origin in the mental actions of the child.

- Social Knowledge is gained from other human beings. It relates to knowledge that one could only have from other persons who have handed on a culture. Social knowledge cannot be constructed by the child, because it is a result of arbitrary conventions among human beings. Social knowledge represents values that are common or diverse. It can-

Present Status

Langer (1969) describes three mechanical and reflective processes of transmitting organized external content to the child and causing him to behave. These are the mechanisms of:

- Direct, overt unconditioned and conditioned associations of stimuli and response
- Imitation
- Mediated, covert associations of stimuli and responses.

These mechanisms account for all the observable, quantitative growth of the child's behavior or acquisition of content.

Stimuli and Responses. The initial cause of a response is always a stimulus. A response is always a passive movement because it reflects the kind of impression made upon the person by the stimulus. Learning theorists describe three kinds of associa-

not be discovered by the child. Languages, artifacts, symbols and signs of one's own and other's cultures are essential knowledge that a child must receive from other people.

- Physical Knowledge is gained when the child makes an association between an object and an action. The only way the child can find out about physical properties of objects is by acting on them and seeing how they react. In actions involving the movement of objects, the child's action is the more important thing and the reaction of the object is of lesser importance. If a child is kicking a ball, for example, more knowledge is gained from attention to the kicking action than observation of the ball. In other cases where an object changes as the result of a child's action, the observation of what happens to the object is more important than what the child does. More knowledge is gained from observing two colors of paint mixing together, than from the child's action of stirring. The child is able to abstract properties of object by attending to one dimension such as the texture and ignoring all the other properties.

- Logicomathematical Knowledge is a kind of abstraction that does not rely on the physical properties of objects but upon the child's action of introducing a relationship between or among objects. Kamii & DeVries give the following example:

> "The most elementary relationship and the foundation for all of the more complex logico-mathematical relationships is between two objects. When the child encounters two spoons of different size, for example, he may think of them as 'the same,' 'different,' 'bigger than,' or 'two.' These relationships exist neighter in one spoon nor in the other. Relationships are literally created by the subject who puts the objects into relationship, and if he did not put them into relationship, for him each object would remain separate and unrelated to the other" (Kamii & DeVries, 1978, pp. 16-17).

tions of stimuli and responses:

- Respondent behavior is conditioned by the appearance of a stimulus.
- Respondent conditioning is a mechanism of stimulus substitution.
- Operant behavior is conditioned by reinforcement of a response.

Imitation. This mechanism is important for social learning and for perceptual learning.

- Social learning: The child observes the behavior of others and uses it as a model. This causes the behavior to become increasingly conformed to social reality.
- Perceptual learning assumes that there is a real world external to the child and that adults teach the child methods of learning the environment. The child acquires precepts that are accurate, photograph-like copies of the world. The child mirrors reality with more exact and comprehensive copies of the world as the child grows.

Mediated, covert associations of stimuli and responses. Reasoning is something manifest in behavior rather than a kind of conscious process. Reasoning is a phenomenon of covert associations in which a class of stimulus situations is linked with a class of responses. Children develop mental steps that intervene between the presentation of a stimulus and the response to it. In concept learning, the child acquires responses to classes of stimuli. A rule is a relation between two or more concepts.

• Self-Knowledge. Forman & Kuschner point out that self-knowledge results from the child's "coordinating information from others, from physical objects, and from an awareness of movement and thought" (Forman & Kuschner, 1983, p. 34).

Light states that while it is clear from the writings of Piaget that social experience and behavior affect the individual's cognitive development, it is not as evident that social experience is a cause of self-awareness. Light finds the work of George Herbert Mead, an American sociologist, a clearer explanation of how the child makes his thoughts and feelings the objects of his own awareness. Light says:

> "Self awareness, then, involves awareness of others. Both emerge at the same time; the child becomes an object of his own experience by taking the attitudes of other individuals towards himself within a context of experience and behaviour in which both he and they are involved.
>
> "Piaget has described intelligence as 'a process which constructs its own objects'. In these terms Mead's 'self' is an object constructed like any other, except for the difficulty that it only exists experimentally insofar as others respond to it. Thus, if intelligence constructs the self-as-other, it does so only in a social context" (Light, 1979, p. 9).

For the learning theorist, knowledge has its source outside the human being. Each person internalizes knowledge through their senses. The internal processes within the individual are mainly what the person has learned before. The sources of knowledge identified by Piaget cover broad domains and are identified by the primary influence, such as the physical environment or other human beings. Because all knowledge is constructed by the person in Piagetian theory, the source of logicomathematical knowledge pervades all the others as it modifies what is

in external reality to the knowledge that the person brings to the encounter.

The language of each theoretical position is so different that it is hard to discuss them together. The learning theorist is talking about processes that are impinging upon persons. Piaget is talking about an active encounter of the individual with the physical and social environments.

WHAT IS DEVELOPMENT?

Desired Status

Development is the transformation of an already present potential into a new posture. Rosen states:

> "The thought processes of children differ substantially from those of adults, just as they do between very young children and older children. These differences are not simply a matter of having less intelligence when younger and more when older. Rather, they are qualitative and attributable to the mental structures which change over time through adaptation and organization" (Rosen, 1977, pp. 9-10).

Thinking integrates physical, affective, social and cognitive aspects of development. The development of a human being is marked by two different dynamics: continuous change and discontinuous change. There is both stability and dramatic transformation in development. Logical thinking in an adult is qualitatively different from the infant's way of adapting to the environment by sensorimotor activity, but adult thinking is founded on that earliest stage and it depends for its extension and elaboration on the richness of the experiences at each earlier stage.

The following diagram from Forman and Kuschner tries to show graphically that development is both

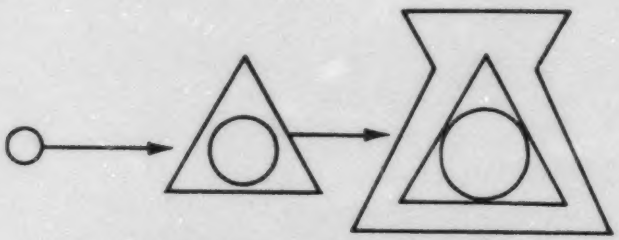
Present Status

Langer states"

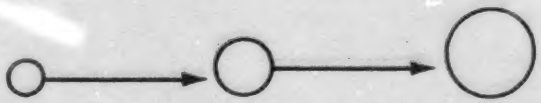
> "Association is the principle assumed by contemporary mechanical mirror theorists to govern not only the organization of:
>
> - stimuli in the external environment
> - the impressions left by these stimuli upon the person, but also
> - the responses of the person to these impressions and
> - the response habits acquired by the person.
>
> Elements in the external environment are presumed to be there in a state of natural association. The newborn child enters this coherently organized world. As a result of progressive associations between the stimuli of the external world and his own responses, external coherence is increasingly transmitted to the child and his responses are increasingly controlled by external stimuli" (Langer, 1969, p. 55).

A graphic of Forman and Kuschner shows this progressively larger repertoire of responses that are developed over time:

continuous and discontinuous: (Forman & Kuschner, 1983, p. 8).



Development as the integration of continuous and discontinuous change



Development as continuous change

When Piaget reported his findings about children's development, the data fell into a common sequence with age-ranges as a useful reference. The age ranges cover broad periods and reflect averages. Any particular child's entry into a new stage might be sooner or later.

Development is uneven both across and between stages for each child. Even when a level of thought is attained, it may not be applied uniformly by the child in all areas. Although the content of a problem may be similar, when it is approached by a child at a later stage, it will be approached quite differently.

Because development is described by Piaget in terms of ages and stages, there have been misuses of the information. Some have felt that children of a particular age need to have attained a particular stage. Others have tried to speed up children's attainment of the next stage. Others have thought Piaget was a maturationalist and have

wanted to wait for development to occur as a child matures. None of these ideas reflect what Piaget has said about development.

These two theories are looking at development in dramatically different ways as the graphics show. They have strong implications for the education of children.

WHAT FACTORS INFLUENCE DEVELOPMENT?

Desired Status

Piaget has identified four factors that are necessary but not sufficient to account for a child's progress from one stage of development to another. These are:

- Maturation, an important factors, but one over which we have no control. Maturational changes in the structure of the brain occur more or less automatically.
- Social Knowledge obtained from other human beings through language, symbols and culture.
- Physical Knowledge, the feedback that the child obtains about the nature of matter from the child's manipulations, perceptual observations, and mental actions on objects.
- Logicomathematical Knowledge, the factor hidden within the mental reflections of the child which creates a relationship among and between objects and events.

- Equilibration, a fifth factor and a state of cognitive conflict and disequilibrium, is considered by Piaget to be the most essential factor to bring about cognitive development.

The usefulness of this fifth factor of cognitive dissonance is recognized by some cognitive psychologists, such as Flavell (1977) to be important

Present Status

Developmental changes include those behaviors that occur at the same time as changes in chronological age, are typical for members of an age group and are moving in the direction shown by the next older age group.

Developmental changes occur in small steps. They build on the preceding behaviors and they are specific rather than general capacities. There is little information on what all children will be like at a given age. All that is needed to predict the child's behavior and to shape it is adequate knowledge of past responses and present conditions of environmental stimulation.

Rohwer, Ammon & Cramer state that apart from physical growth, development results from learning.

> "Some performance changes can be brought about without learning from scratch everything necessary for change.... three mechanisms responsible for such changes (are): generalization, horizontal transfer, and vertical transfer" (Rohwer, Ammon, & Cramer, 1974, p. 61).

- Generalization occurs when a stimulus evokes a previous response as well as other similar responses. A response made to one stimulus will

rather than essential. Flavell suggests that different tasks may call for different processes, or different individuals may use different processes.

be made to another stimulus which is similar.

- Horizontal transfer occurs when a skill or association learned in one task is used in another task or context.
- Vertical transfer occurs when the content to be learned has a particular order to it, and the learner has the prerequisite skills.

Learning theorists acknowledge the neurophysiological limitations of maturation, but it receives no attention. Regularities in the environment appear to account for the influences that learning theorists find important. The sources of knowledge and a factor of incongruity or dissatisfaction or cognitive conflict are sources for growth in the Piagetian theory.

WHAT IS LEARNING?

Desired Status

Learning is acquiring a skill or specific information based on one's current intellectual structures or development. Development determines to a large extend how learning can proceed. Because children are continuously constructing frameworks of structures between their own activities and the external world, how they take in that world determines and directs the learning process and it depends on their developmental level. Learning is integrated into each child's particular structures and can be reproduced from those structures. Comprehension is the process of the child fitting in the new with what the child already knows.

Learning is provoked by situations or by a teacher rather than being a spontaneous occurrence. When learning is limited to a single problem, it is dependent on association and recall; it is relatively isolated from the child's mental structures.

Present Status

Learning is an observable change in behavior that occurs as a result of experience. Jensen (1969) states:

"The simplest, most extreme statement of this position is simply that humans, like all mammals, possess the neural structures for the formation of associations between the sensory inputs from receptors and the output mechansims of the effectors. This is, in short, the capacity for stimulus-response connections or habits. The set of habits which we identify as intelligent behavior are seen as being built up through the acquisition of habits and chains of habits which interact to product complex behavior" (Jensen, 1969, p. 2).

Langer states:

"Associations are cumulative. With time the child acquires a huge number of associations which are added to each other to form a large repertoire of

Crain states:

"For Piaget...true learning is not something handed down by the teacher, but something that comes from the child. It is a process of active discovery....Accordingly, the teacher should not try to impose knowledge on the child, but he or she should find materials that will interest and challenge the child and then permit the child to solve problems on his or her own" (Crain, 1980, p. 98).

habitual modes of response. This behavioral repertoire is continuously changing as a consequence of:

- the acquisition of new links
- the use of already acquired links (the degree to which a response is practiced or repeated determines its current strength)
- the disuse of links, which results in their extinction or decay....

The major mechanical mirror developmental hypothesis is therefore that early conditioned associations affect the child's behavior later in life" (Langer, 1969, p. 55).

Learning is at the heart of the Behaviorist theory and it implies quite a different approach than is recommended by Piaget. It is a filling up of the person with more and more complex networks of information. It is behavior that is maintained by practice and reinforcement. The Piagetian approach does not have a body of information that has to be imparted, because there is a belief that this process is unique to the individual and learning can only be facilitated rather than imparted.

WHAT IS THE RELATIONSHIP OF LANGUAGE TO THOUGHT?

Desired Status

Flavell states the contrast between Piagetian ideas about the role of language and thought:

"Some scholars have viewed the language-thought connection as essentially one of 'LANGUAGE (thought)': that is, thought is regarded as either virtually identical to language or else utterly dependent on it for functioning....In marked contrast, Piaget takes what might be depicted as a 'THOUGHT (Language, mental image, drawing, etc.)' position" (Flavell, 1977, p. 37).

By this comparison, Flavell is pointing out that language is by far the most important of the sym-

Present Status

Engelmann states:

"The child can take the words and formulas of language and construct rules from them. Language is the quickest and most certain way to teach the higher abstractions a child should learn.... The child can turn verbal statements into rules just as you can change his rules into verbal statements. That's because the cores of the thought and the verbally stated concept are identical. To the teacher this means that she can present stripped-down streamlined concepts, reduced to their logical core. She can present them as a series of statements" (Engelmann, 1966, p. 73-75).

bolic media, but thinking precedes language and makes the development and use of language possible. The child learns to express in one's native language what the child already knows.

Rosen states:

> "The traditional approach has maintained that, as the child gains linguistic ability, he uses his language to order and understand the world in which he lives. The radical constructivist psychology of Piaget has inverted this sequence. The construction and existence of cognitive structures will determine language acquisition and what can be known about reality. A child who does not have the appropriate structures may use certain words, but it can be demonstrated that he does not truly understand what he is talking about. It can be further demonstrated that certain language characteristics invariably emerge only after the corresponding cognitive structures have developed. Piaget's contention essentially is that language is not necessary or sufficient for intellectual development to occur" (Rosen, 1977, p. 75).

Engelmann gives many examples of statements, such as: "When you face me, your left is my right, but your up is my up" (Engelmann, 1966, p. 72). This is a technique for parents of prekindergarten children.

Two Russian researchers, Vygotsky and Luria, have held that higher forms of intelligence and thought are achieved because language is developed.

Language is an important developmental acquisition for the young child. The issue in this discussion is whether it is necessary for thought. Much of the work of Piaget on the importance of dialogue with peers to gain the viewpoint of another person gives great importance to language. This is a far different use of language than for the rote learning encouraged by Engelmann.

WHAT IS THE RELATIONSHIP OF PLAY TO THOUGHT AND LEARNING?

Desired Status

Present Status

Garvey (1977) gives five characteristics that define play:

- Play is pleasurable, enjoyable....
- Play has no extrinsic goals....
- Play is spontaneous and voluntary....
- Play involves some active engagement....
- Play has certain systematic relations to what is not play....

Rowher, Ammon & Cramer state:

"Much of a young child's life is taken up with activities that adults refer to as play. The common view of play is that it provides a means of relaxation and a source of pleasure, but little else. However, from a biological perspective, it would be most unusual to find a species in which a large portion of an individual's behavior had no adaptive value" (Rohwer, Ammon & Cramer, 1974, p. 249).

Piaget describes play as an activity in which assimilation predominates over accommodation. It will be helpful to review what he means by those terms. He says: Assimilation is chiefly a biological concept. By digesting food, the organism assimilates the environment; this means that the environment is subordinated to the internal structure and not the reverse.... A rabbit that eats a cabbage doesn't become a cabbage; it's the cabbage that becomes rabbit -- that's assimilation" (Bringuier, 1980, p. 42).

There is, however, no assimilation without accommodation. Assimilation is determined by the person. Accommodation is determined by the object. Every object or situation requires the subject to modify to the particular circumstances of the situation.

In play the child transforms reality into something else rather than making adjustments to reality. The child, however, has to accommodate to certain realities within the play. Because play involves a certain amount of accommodation, it expands the child's cognitive structures. When the child is faced with realities, the child can make use of the structures learned in play.

Kamii discusses four levels of play found in the research of Piaget:

Goodlad states:

"There are...'soft spots' in the current hierarchy. The first is the transition from so-called preschooling to the first grade.... The perspective and practices of nursery school and kindergarten teachers are more child-oriented and less subject-oriented than those of primary teachers.... The transitions from nursery school to kindergarten and to the first grade are bumpy for those enrolled throughout....

"I believe it reasonable to assume, with these seams removed, that what is now accomplished by the end of the third grade (age 9) could easily be accomplished by the end of the proposed primary phase (age 8)--a saving of one year. The years from 4 to 8 are generally believed by specialists in child development to be unusually propitious for sound educational intervention" (Goodlad, 1984, pp. 326-327).

- motor and individual play
- play alone or beside a partner
- the beginnings of cooperative play while observing common rules
- group games with rules.

Kamii believes that group games are important for helping children to decenter and take into consideration different points of view and for learning to develop rules. Group games foster the development of autonomy. Kamii states:

"Children develop not only socially, morally and cognitively but also politically and emotionally through games involving rule" (Kamii & DeVries, 1980, p. 27).

Play is not a valued part of learning for those who believe in a behavioral engineering approach to learning. It is not even a topic that is discussed. It is interesting to note that Goodlad quotes child development specialists as his authority about the importance of the early years, but his idea of a smooth transition from preschool to third grade does not make use of child development theory. Garvey points out that play has been linked with creativity, problem-solving, language learning, the development of social roles and other cognitive and social areas of growth.

HOW SHOULD ONE TEACH?

Desired Status

Rohwer, Ammon & Cramer suggest two basic strategies for helping the learner.

- An old cognitive structure can be extended to incorporate new content. This might occur through analogy or through play.
- A new cognitive structure can be developed for thinking about old content. This occurs when the child experiences disequilibrium or cognitive dissonance.

They conclude:

"...the learner actively assimilates the environ-

Present Status

Jensen states:

"...we have accepted traditional instruction so completely that it is extremely difficult even to imagine, much less put into practice, any radically different forms that the education of children could take. Our thinking almost always takes as granted such features as beginning formal instruction at the same age for all children (universally between ages five and six), instruction of children in groups, keeping the same group together in lock-step fashion through

> ment to his present level of thinking and in the process, he constructs higher levels of thinking by his own activity. The purpose of education is to help the learner do this" (Rohwer, Ammon, & Cramer, 1974, p. 264).

These authors go on to discuss the consequences of not teaching the learner new content in terms of familiar structures. They point out that it may not be assimilated at all, it may not be assimilated at the intended level, it may be structured by the learner in a way that actually interferes with later learning.

Piaget has said (1964):

> "It is my belief that teachers should not only learn child psychology in their courses, but actually carry out their own research to see how difficult it is to make themselves understood by the children and to understand what the children are saying. The illusions that teachers have in front of classes of children are that they are making themselves understood and that children are understanding. These two illusions must be dissipated."

In another place Piaget has said:

> "...what I've found in my research seems to me to speak in favor of an active methodology in teaching. Children should be able to do their own experimenting and their own research. Teachers, of course, can guide them by providing appropriate materials, but the essential thing is that in order for a child to understand something, he must construct it himself, he must re-invent it....that which we allow him to discover by himself will remain with him visibly...for all the rest of his life" (Piaget, 1972, p. 27).

> the several years of schooling...." (Jensen, 1969, p. 7)

Jensen discusses the following relationship between teacher and child:

Teacher	Child
• Active	• Passive
• Showing	• Seeing
• Telling	• Listening

and he goes on to explain that satisfactory learning occurs under these conditions only when children come to school with certain prerequisite skills:

- An attention span long enough to encompass the teacher's utterances and demonstrations.
- The ability to focus one's attention where it is called for voluntarily.
- The ability to comprehend verbal utterances.
- The ability to grasp relationships between things and their symbolic representations.
- The ability to inhibit large-muscle activity.
- The ability to engage in covert "mental" activity.
- The ability to repeat instructions to oneself.
- The ability to persist in a task until a self-determined standard is attained.

Ausubel & Robinson state:

> "...the school's intent is to foster the highest degree of meaningful learning that is possible in any particular situation. It was assumed that a large part of the child's time will be spent in reception learning or, conversely, that a large part of the teacher's time will be spent on expository teaching. In other words, it was assumed that where feasible it would be in the interests of economy to present new content to the learner in more or less final form; the latter's task, subsequently will be to incorporate this material

Wolff (1979) has suggested that the teacher is indispensable to create the situation and construct the initial devices which present useful problems to the child. He also sees a role for the teacher in providing counter-examples which compel the learner to reflect and reconsider over-hasty solutions.

Forman suggests something similar:

> "...the teacher's role is trouble maker, albeit a sensitive trouble maker. The staging of conflict, judiciously dispensed, is a teaching technique that is consonant with Piaget's constructivism. Conflict comes from a clash of ideas and it is only through rethinking that the clash will be resolved" (Forman, 1977, p. 10).

The sources of knowledge give teachers ideas about how to teach. Since other human beings are the source of social knowledge, it is appropriate for the teacher to help children gain this arbitrary knowledge by telling them or giving them feedback about their experiences. For physical knowledge and logicomathematical knowledge the teacher cannot be a source of knowledge for the student. Questioning techniques and counter-suggestions may be used to guide students in these areas. Social experience requires that children have many social interactions with peers.

Almy states:

> "Piaget once described an ideal classroom setting as one with two rooms. In the first, the teacher would instruct the children; in the second, the children would work by themselves. I asked him about the ages of the children in such a group. He said ideally, every child should be associated with those who were a bit more advanced than he" (Almy, 1977, p. 6).

into his cognitive structure in order for it to be available for later reproduction, related learning, or problem solving" (Ausubel & Robinson, 1969, p. 96).

Squires, Huitt, & Segars in discussing effective schools and classrooms give the following sequence for effective instruction as it has been identified in research studies:

"Presentation
- Overview
  - Review
  - What
  - Why
- Explanation
- Students demonstrate understanding

Practice
- Guided/controlled
- Independent

Performance
- Daily work
- Unit tests
- Periodic review "

Feedback

(Squires, Huitt, & Segars, 1983, p. 20).

These same authors state: "The teacher continually provides feedback as to whether the students' understandings are correct, and if not, provides and explains the correct answers" (Squires, Huitt, & Segars, 1983, p. 20).

Almy identifies five essential elements in an educational program based on Piaget's theory:

- Active methods and an environment geared to the interests and needs of the stages of development of the children.
- Social relationships among children fostered as a means of learning.
- Less concern with particular subjects than with the logicomathematical structures underlying and interrelating them.
- Teachers with advanced scientific and technical training.
- Teaching methods using an experimental pedagogy

(Almy, 1977, p. 3).

Furth and Wachs (1972) operated a school for thinking for children in primary grades. They state that a teacher can influence a child's developing intelligence in two ways only: by providing occasions and opportunities and by being a model of a thinking person for the children. These authors feel that if a teacher's thinking is more articulate in practice than in theoretical discourse, that is appropriate. The application of a theory will enrich the theory.

Kamii (1981) states that for children to develop moral autonomy it is necessary for adults to reduce their authority and to allow the children to develop a sense of responsibility for their own actions and choices. Mutual respect and affection must exists among adults and children for the development of moral autonomy. Authority will not be used by adults as power, but it will become a reference point to help children grow. Adults will use authority as a reference point by:

- temporary exclusion of a child from the group.
- depriving a child of a thing misused.
- helping a child make restitution.
- or pointing out to a child the consequences of a planned action.

There are clear differences in the way teachers are to behave under these two different theoretical positions. For the Piagetian approach the child is expected to go through successive levels of being wrong simply as part of their developmental growth toward understanding and the teacher is to make use of those errors to analyze where the child is. The learning theorist feels as Engelmann does that even the preschool child doesn't have much time. The Piagetians feel that teaching any amount of specific learning is not going to result in greater general intelligence.

WHAT SHOULD THE CURRICULUM BE LIKE?

Desired Status

Willis points out:

> "...the preponderant emphasis in curriculum thought since at least the early 1950s has been on a normative conception of curriculum concerned with learning and activity, one explicated by Tyler and accepted by Taba and McNeil, among many others...and since the basic material of curriculum phenomena exists in the inward experience of students reacting to their educational environments, curriculum theory needs ultimately to account for the nature of experience" (Willis, 1970, p. 47).

Willis does not want to dichotomize curriculum thinkers into two irreconcilable camps, but rather to overcome an imbalance in curriculum thinking. He states that the Tyler and Taba analysis was concerned with facilitating learning measured in overt activity, for much of what people do and learn is overt. He feels that when curriculum theory is conceived as nonnormative and concerned with creating educational environments that enhance the quality of experience, we will uncover problems that the normative conception of curriculum obscures. He says:

> "...most notably the inevitable discrepancies between the few impoverished, operationalized goals

Present Status

Adler advanced the Paideia Proposal, common learnings for all children in the 12 years of public school. They include:

- Language, literature, and the fine arts; mathematics and natural science; history, geography and social studies. Students will acquire organized knowledge in these areas by didactic instruction.
- Linguistic, mathematical and scientific skills in performance through coaching the student to organize sequences of acts in correct fashion and correcting performance again and again through drilling.
- Books and products of human artistry will be used to question students by the Socratic method and through performance.

Adler and his colleagues feel:

> "It is natural for children to rise to meet higher expections, but only if those expectations are set before them...." (Adler, 1983, p. 35).

Tyler (1950) feels that the best way to determine educational objectives is by identifying the activities of contemporary life and screening these through subject specialists, philosophers and psychologists and not attempting to do in school

called 'learning' and the many rich, comple human reactions to the wider environment upon which educational operations ultimately impinge" (Willis, 1970, p. 47).

Kohlberg and Mayer (1978) proposed development as the aim of education. They claimed that the developmental-philosophical strategy for defining educational objectives which emerges from the work of Dewey and Piaget is a theoretical rationale which withstands logical criticism and is consistent with research findings. They responded to the criticism that the concept of development, with its connotation of natural, is unsuited to determine educational policy by pointing out that development depends on experience. Cognitive-developmental theory postulates a formal, internal standard of adequancy. They state:

"...only about half of the adult American population fully reaches Piaget's stage of formal operational reasoning and only 5% reach the highest moral stages" (Kohlberg & Mayer, 1978, p. 160).

To a second criticism that development is too vague to genuinely clarify the choice of the curricular content and aims of education, Kohlberg and Mayer respond:

"We cannot dispose of 'growth in reading' as an educational objective...simply because it is not a universal in development. But we argue that the ultimate importance of learning to read can only be understood in the context of more universal forms of development. Increased capacity to read is not itself a development, although it is an attainment reflecting various aspects of development. The value or importance of reading lies in its potential contribution to further cognitive, social and aesthetic development" (Kohlberg & Mayer, 1978, p. 161).

what can be accomplished informally or by other agencies. For Tyler curriculum theory is primarily normative and concerned with facilitating learning measured in overt activity.

Goodlad (1984) recalled that Tyler had recommended that principals and teachers should have a set of a dozen or so educational goals to guide program development and teaching in the schools, a set of common purposes for everyone to strive for. He reviewed these goals from the 50 states and developed ten of his own which he feels have considerable national agreement:

"• Mastery of basic skills and fundamental processes....
• Intellectual development....
• Career education-vocational education....
• Interpersonal understandings....
• Citizen participation....
• Enculturation....
• Moral and ethical character....
• Emotional and physical well-being....
• Creativity and aesthetic expression....
• Self-realization...."
(Goodlad, 1984, pp. 51-56).

Goodlad's staff observed 129 elementary schools and found:

"Nearly 100% of the elementary classes were almost entirely teacher dominated with respect to seating, grouping, content, materials, use of space, time utilization and learning activities....about 75% of class time was spent on instruction.... nearly 70% of this was 'talk' - usually teachers to students. Teachers out-talked the entire class of students by a ratio of about three to one.... barely 5% of this instructional time was designed to create student's anticipation of needing to re-

Duckworth recommends this role for schools:

> "David Hawkins has said of curriculum development, 'You don't want to cover a subject; you want to uncover it.' That...is what schools should be about. They can help to uncover parts of the world which children would not otherwise know how to tackle. Wonderful ideas build on other wonderful ideas. They are not without content. In Piaget's terms, you have to reach out to the world with your own intellectual tools and grasp it, assimilate it, yourself. All kinds of things are hidden from us - even though they surround us - unless we know how to reach out for them. Schools and teachers can provide materials and questions in ways that suggest things to be done with them; and children, in the doing, cannot help being inventive.
>
> "There are two aspects to providing occasions for wonderful ideas, then. One is being prepared to accept children's ideas. The other is providing a setting which suggests wonderful ideas to children - different ideas to different children - as they get caught up in intellectual problems that are real to them" (Duckworth, 1978, p. 115).

Applications of this developmental theory to content in the subject matter areas cannot be made directly. The following resources have been grouped into categories resembling those areas:

- Reading: Elkind (1979), (1981)
- Spelling: Duckworth (1976)
- Physical Knowledge: Kamii & DeVries (1978)
- Group Games: Kamii & DeVries (1980)
- Music: Furth (1970)
- Number: Kamii (1982)
- General Curriculum Areas: Forman & Kuschner (1983), Furth & Wachs (1972), Hohmann, Banet, & Weikart (1979), Kamii (1981), Lavatelli (1970), Labinowicz (1980), Wadsworth (1978).

> "spond. Not even 1% required some kind of open response involving reasoning or perhaps an opinion from students" (Goodlad, 1984, p. 229).

When Goodlad reviewed curriculum he found:

> "Two major deficiencies stand out in all aspects of the curricula we studied....The first is a failure to differentiate and see the relationships between facts and the more important concepts facts help us to understand. The second ...is a general failure to view subject and subject matter as turf on which to experience the struggles and satisfactions of personal development" (Goodlad, 1984, p. 237).

- An Analysis of Programs in Early Childhood: Almy (1979), Kamii (1973), Forman & Twomey Fosnot (1982).

Selman (1978) suggests:

> "...since Piaget's conception of development is difficult to communicate, a writer labeling activities as Piagetian should make clear to the reader exactly what is developmental about them. This requires explanation of activities in terms which clearly indicate how a child's interaction with an activity reflects a given level of development and how a given level of development is more or less adequate than another" (Selman, 1978, p. 202).

Selman defines a progression of social thought:

0 child confuses the perspectives of self and other.
1 other's subjective thoughts and feelings are distinct from self's.
2 other can consider self's subjective attitudes and feelings.
3 self and other can view self's and other's point of view mutually and simultaneously.
4 there is a general social viewpoint that transcends individual perspectives.

This paper has not discussed the stages of development that Piaget has described. Gruber & Voneche (1977) consider them to be important as a descriptive tool. They state that Piaget used them "vigorously as a framework on which to organize his findings" but he has not used them in talking about his theory. They feel it is his response to those who might say: "During a given stage the person does thus and so, and he can do no other" (Gruber & Voneche, 1977, p. xxvi).

When Duckworth talks about curriculum for schools, it does not sound different from what Goodlad is advocating. It is, in fact, very different. We know this when we find Goodlad saying: "...schools are to do more than teach the funda-

mental mathematical operations of adding, subtracting, multiplying and dividing. In addition, they should help students see the significance of the relationship between the hypotenuse and the other two sides of a right-angled triangle in constructing a flight of steps, for example" (Goodlad, 1984, p. 299).

Piaget tells a story about a mathematician friend of his:

> "When he was a small boy, he was counting some stones and he counted them from left to right and found there were ten. Then he counted them from right to left and, lo and behold, there were ten again. Then he put them in a circle, and finding ten once again, he was very, very excited. He found, essentially, that the sum is independent of the order. This is a discovery. It is a reflective abstraction stemming from his own actions. The order was not in the stones themselves. It was his actions that gave the stones their orderly arrangement. The sum wasn't in the stones either; there was no sum until he came and put the stones in one-to-one correspondence with the number system. What he found, then, was that his action of ordering the stones and his other action of adding them up were independent of one another, and a different ordering action did not lead to a different sum. Reflective abstraction is a general practice in mathematics. New findings in mathematics are produced by carrying out operations on other operations" (Piaget, 1972, pp. 23-24).

Goodlad is talking about teachers giving more practical applications to their rote teaching. Piaget is talking about quite another process and quite a different product. Piaget says of education world-wide: "Our school system, as much under left-wing as under right-wing regimes has been conducted by conservatives (from the pedagogic point of view) who were thinking much more in terms of fitting our rising generations into the molds of traditional learning than in terms of training inventive and critical minds" (Piaget, 1969, p. 124).

WHAT EDUCATIONAL POLICIES ARE NEEDED TO FOSTER PIAGETIAN PERSPECTIVES FOR EARLY CHILDHOOD EDUCATION IN MINNESOTA?

We are already involved in a policy for change in our schools through the effective schools legislation. A process for making change in public schools has been developed and pilots sites are in the process of implementing a change process in their schools. The research findings on which this program is based come out of the learning theory orientation to education. It would seem that the process for making institutional change would not need to interfere with the content of change.

The fact that a whole body of scientific research on how children acquire knowledge is being ignored in the process of making change in our schools should be alarming to more than persons in early childhood. Marked developmental changes occur in the learner during adolescence as well.

It would seem appropriate to use the vehicle of effective schools legislation to help districts come in contact with this vast area of research that affects how teachers teach and how children learn. More education about the learner is only seen as relevant if one has the concept of development advocated in this paper.

Because teachers are at the heart of what happens in a Piagetian classroom and because the pedagogy will be experimental, teachers will need help in thinking about what to teach, how to teach it and why it is important. They will need the support of their school boards, administrators, other teachers and parents.

There are some restrictions on the teacher's autonomy that have their source in a commitment to learning theory.

- One is the view of knowledge as it has come to be organized into disciplines and the assumption that because it has an inherent logic to the adult community, it should be taught to children in that same way. The proposal of Adler's is an example of this. Each discipline isolates logical sequences of hierarchies within their subject, discipline or area and orders that content so it can be taught in a systematic, logical way.
- Another is the specification of objectives to be learned and the assessment of success based on these measurable objectives. It is what Squires, Huitt, and Segars advocate and describe as "Coverage: the amount of content covered by the student during a year, especially content tested by a standardized instrument...and Success: how well students perform on daily assignments and unit tests indicating mastery of academic content" (Squires, Huitt, & Segars, 1983, p. 4).
- The Piagetian goal of autonomy for the student is limited by what Squires, Huitt, & Segars advocate for teachers and call "Management: all the skills and techniques that are primarily intended to control students' behavior...." (Squires, Huitt, & Segars, 1983, p. 17).

CONCLUSION

A Piagetian approach is the direction that education must take. We live in a

rapidly changing world demanding persons who can think flexibly, inventively, and creatively and who have a developed sense of morality. Our model of schooling is not capable of bringing out these qualities in its graduates.

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